

Amendment and Remarks  
Serial No. 10/015,126  
Page 2 of 18

### CLAIMS

1. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings oriented along the longitudinal axis of the part;

a reinforcing structure ~~comprising~~ having a thickness of about 0.004 - 0.020 inches and consisting essentially of a permeable transport web of staple fibers bonded to a plurality of first reinforcing fibers oriented in a generally planar non-overlapping configuration so that the first reinforcing fibers do not extend over or cover one another and so that a portion of the first reinforcing fibers oriented in a transverse direction to the longitudinal rovings comprises at least 40% of a volume of materials comprising the reinforcing structure;

a plurality of second reinforcing fibers oriented in a direction different than the direction of the first reinforcing fibers and in a generally planar non-overlapping configuration so that the second reinforcing fibers do not extend over or cover one another; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the wall thickness of the pultruded part is about 0.025-0.045 inches.

2. (Previously Presented) The pultruded part of claim 1 wherein the portion of the reinforcing fibers oriented in the transverse direction comprises at least 50% of a volume of materials comprising the reinforcing structure.

3. Cancelled

4. (Previously Presented) The pultruded part of claim 1 wherein the staple fibers comprise a length of about  $\frac{1}{2}$  - 4 inches.

Amendment and Remarks  
Serial No. 10/015,126  
Page 3 of 18

5. (Previously Presented) The pultruded part of claim 1 wherein the staple fibers comprise a length of about 0.01 - 12 inches.

6. (Original) The pultruded part of claim 1 wherein the permeable transport web comprises heat-fusible fibers.

7. (Original) The pultruded part of claim 1 wherein the permeable transport web comprises at least two different polymeric fibers each comprising a different glass transition temperature.

8. (Original) The pultruded part of claim 7 wherein the at least two polymeric fibers comprise a glass transition temperature of about 350 °F and about 270 °F, respectively.

9. (Original) The pultruded part of claim 1 wherein the permeable transport web comprises:

a plurality of first polymeric fibers comprising a first glass transition temperature; and

a plurality of bi-component fiber wherein a first component comprises the first glass transition temperature and a second component comprises a second glass transition temperature less than the first glass transition temperature.

10. (Original) The pultruded part of claim 9 wherein the bi-component fibers comprise a core-sheath configuration.

11. (Original) The pultruded part of claim 1 wherein the permeable transport web comprises in-plane mechanical and directional stability.

Amendment and Remarks  
Serial No. 10/015,126  
Page 4 of 18

12. (Previously Presented) The pultruded part of claim 1 wherein the permeable transport web comprises a plurality of fibers at least a portion of which are randomly entangled with the reinforcing fibers.

13. (Previously Presented) The pultruded part of claim 1 wherein the permeable transport web comprises a plurality of fibers at least a portion of which are thermally bonded with the reinforcing fibers.

14. (Currently Amended) The pultruded part of claim 1 wherein the reinforcing fibers are spaced apart and ~~attached~~ bonded to the permeable transport web by a continuous stitching fiber.

15. (Previously Presented) The pultruded part of claim 14 wherein the stitching fiber comprises glass fibers; natural fibers; carbon fibers; metal fibers; ceramic fibers; synthetic or polymeric fibers; composite fibers including one or more components of glass, natural materials, metal, ceramic, carbon, or synthetics components; or a combination thereof.

16. (Previously Presented) The pultruded part of claim 1 comprising a binder bonding the permeable transport web to the reinforcing fibers.

17. (Previously Presented) The pultruded part of claim 16 wherein the binder comprises one or more of a latex binder, a polyvinyl acetate emulsion, or a crosslinking polyvinyl acetate emulsion.

18. (Previously Presented) The pultruded part of claim 1 comprising a plurality of perforations through the permeable transport web and extending between the reinforcing fibers.

Amendment and Remarks  
Serial No. 10/015,126  
Page 5 of 18

19. (Original) The pultruded part of claim 1 wherein the reinforcing structure comprises a permeability of at least  $180 \text{ ft}^3/\text{minute}/\text{ft}^2$  as measured according to the procedure of ASTM D737-96 with a pressure differential of about 0.5 inch column of water.

20. (Original) The pultruded part of claim 1 wherein the reinforcing structure comprises a permeability of about  $300 \text{ ft}^3/\text{minute}/\text{ft}^2$  as measured according to the procedure of ASTM D737-96 with a pressure differential of about 0.5 inch column of water.

21. (Original) The pultruded part of claim 1 wherein the reinforcing structure comprises a permeability of more than  $350 \text{ ft}^3/\text{minute}/\text{ft}^2$  as measured according to the procedure of ASTM D737-96 with a pressure differential of about 0.5 inch column of water.

22. (Original) The pultruded part of claim 1 wherein the reinforcing structure comprises a circular bending stiffness of at least about 4 Newtons as measured according to the procedure of ASTM D4032-94.

23. (Original) The pultruded part of claim 1 wherein the reinforcing structure comprises a circular bending stiffness in a range of at least about 4 Newtons to about 15 Newtons as measured according to the procedure of ASTM D4032-94.

24. Cancelled

25. (Previously Presented) The pultruded part of claim 1 wherein the reinforcing structure comprises a thickness of about 0.010 - 0.012 inches.

26. (Original) The reinforcement structure of claim 1 wherein the reinforcement structure comprises a tensile strength in the transverse direction of about 200 lbs/inch as measured using the procedure of ASTM D76-99.

Amendment and Remarks  
Serial No. 10/015,126  
Page 6 of 18

27. (Previously Presented) The reinforcement structure of claim 1 wherein the reinforcement structure comprises a tensile strength in a pull direction of at least 6 lbs/inch as measured using the procedure of ASTM D76-99.

28. (Previously Presented) The pultruded part of claim 1 wherein the reinforcing fibers comprise glass fibers; natural fibers; carbon fibers; metal fibers; ceramic fibers; synthetic or polymeric fibers; composite fibers including one or more components of glass, natural materials, metal, ceramic, carbon, or synthetics components; or a combination thereof.

29. (Previously Presented) The pultruded part of claim 1 wherein the reinforcing fibers comprise at least one polymeric component.

30. (Previously Presented) The pultruded part of claim 1 wherein the reinforcing fibers comprise a surface treated with an organosilane agent.

31. (Previously Presented) The reinforcement structure of claim 30 wherein the organosilane agent comprises one or more families of a cationic amino-functional silane, tris (2- methoxyethoxyvinylsilane), or 3-methacryloxypropyltrimethoxysilane.

32. (Previously Presented) The pultruded part of claim 1 wherein the transverse direction comprises a direction about  $90^{\circ} \pm 10^{\circ}$  relative to a pull direction.

33. (Previously Presented) The pultruded part of claim 1 wherein the transverse direction comprises a direction about  $90^{\circ} \pm 5^{\circ}$  relative to a pull direction.

34. (Previously Presented) The pultruded part of claim 1 wherein substantially all of the reinforcing fibers extend continuously across a width of the reinforcing structure.

Amendment and Remarks  
Serial No. 10/015,126  
Page 7 of 18

35. Cancelled

36. Cancelled

37. Cancelled

38. Cancelled

39. Cancelled

40. Cancelled

41. Cancelled

42. Cancelled

43. Cancelled

44. Cancelled

45. Cancelled

46. Cancelled

47. Cancelled

48. (Previously Presented) The pultruded part of claim 1 wherein the longitudinal rovings comprise glass fibers; natural fibers; carbon fibers; metal fibers; ceramic fibers; synthetic or polymeric fibers; composite fibers including one or more components of glass,

Amendment and Remarks  
Serial No. 10/015,126  
Page 8 of 18

natural materials, metal, ceramic, carbon, or synthetics components; or a combination thereof.

49. Cancelled

50. Cancelled

51. (Original) The pultruded part of claim 1 wherein the longitudinal rovings and the reinforcing structure comprise alternating layers.

52. (Original) The pultruded part of claim 1 wherein the reinforcing structure is located adjacent to an outer surface of the pultruded part.

53. (Original) The pultruded part of claim 1 wherein the longitudinal rovings are located adjacent to an outer surface of the pultruded part.

54. (Original) The pultruded part of claim 1 comprising a plurality of longitudinal rovings adjacent to both surfaces of the reinforcing structure.

55. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings extending along the longitudinal axis of the part;

a reinforcing structure consisting essentially of a plurality of first reinforcing fibers oriented in a transverse direction to the longitudinal rovings and in a generally planar non-overlapping configuration so that the first reinforcing fibers do not extend over or cover one another;

a plurality of second reinforcing fibers oriented in a direction different than the direction of the first reinforcing fibers; and in a generally planar non-overlapping configuration so that the second reinforcing fibers do not extend over or cover one another;

a permeable transport web bonded to the reinforcing fibers comprising a plurality of first polymeric fibers comprising a first glass transition temperature and a plurality of bi-component fiber wherein a first component comprises the first glass transition temperature and a second component comprises a second glass transition temperature less than the first glass transition temperature so that the first reinforcing fibers, second

Amendment and Remarks  
Serial No. 10/015,126  
Page 9 of 18

reinforcing fibers and transport web form a reinforcing structure having a thickness of 0.004-0.020 inches; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the pultruded part has a wall thickness of about 0.025-0.045-inches.

56. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings extending along the longitudinal axis of the part;

a reinforcing structure having a thickness of about 0.004 - 0.020 inches and consisting essentially of a plurality of first reinforcing fibers oriented in a transverse direction relative to the longitudinal axis thermally and in a generally planar non-overlapping configuration so that the first reinforcing fiber does not extend over or cover one another;

a plurality of second reinforcing fibers oriented in a direction different than the direction of the first reinforcing fibers and in a generally planar non-overlapping configuration so that the second reinforcing fibers do not extend over or cover one another;

permeable transport web of staple fibers bonded to the reinforcing fibers so that the reinforcing structure comprises a permeability of at least 180 ft<sup>3</sup>/minute/ft<sup>2</sup> as measured according to the procedure of ASTM D737-96 with a pressure differential of about 0.5 inch column of water; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the pultruded part has a wall thickness of about 0.025-0.045 inches.

57. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings extending along the longitudinal axis of the part;

a reinforcing structure having a thickness of about 0.004 - 0.020 inches and consisting essentially of a plurality of first reinforcing fibers oriented in a transverse direction to the longitudinal rovings and in a generally planar non-overlapping configuration so that the first reinforcing fiber does not extend over or cover one another;



Amendment and Remarks  
Serial No. 10/015,126  
Page 10 of 18

a plurality of second reinforcing fibers oriented in a direction different than the direction of the first reinforcing fibers and in a generally planar non-overlapping configuration so that the second reinforcing fibers do not extend over or cover one another;

wherein the first and second reinforcing fibers are bonded to a permeable transport web of staple fibers such that a ratio of a modulus of elasticity of the reinforcing structure in the transverse direction relative to a modulus of elasticity in a pull direction comprises at least 1.2; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the pultruded part has a wall thickness of about 0.025-0.045 inches.

58. (Previously Presented) The reinforcing structure of claim 57 wherein the ratio of the modulus of elasticity of the reinforcing structure in the transverse direction relative to the modulus of elasticity in a pull direction comprises at least 1.5.

59. (Previously Presented) The reinforcing structure of claim 57 wherein the ratio of the modulus of elasticity of the reinforcing structure in the transverse direction relative to the modulus of elasticity in a pull direction comprises at least 3.

60. (Previously Presented) The reinforcing structure of claim 57 wherein the ratio of the modulus of elasticity of the reinforcing structure in the transverse direction relative to the modulus of elasticity in a pull direction comprises at least 5.

61. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings extending along the longitudinal axis of the part;

a reinforcing structure having a thickness of about 0.004 - 0.020 inches and consisting essentially of a plurality of first reinforcing fibers oriented in a transverse direction to the longitudinal rovings and in a generally planar non-overlapping configuration so that the first reinforcing fiber does not extend over or cover one another;

a plurality of second reinforcing fibers oriented in a direction different than the direction of the first reinforcing fibers and in a generally planar non-overlapping configuration so that the second reinforcing fibers do not extend over or cover one another;

Amendment and Remarks  
Serial No. 10/015,126  
Page 11 of 18

a permeable transport web of staple fibers bonded to the reinforcing fibers so that the portion of the reinforcing fibers extending in a transverse direction comprises at least 30% of a volume of materials comprising the reinforcing structure; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the pultruded part has a wall thickness of about 0.025-0.045 inches.

62. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings extending along the longitudinal axis of the part;

a reinforcing structure having a thickness of about 0.004 - 0.020 inches and consisting essentially of: comprising

a plurality of first reinforcing fibers oriented at  $45^{\circ}$  (+/-  $15^{\circ}$ ) relative to a pull direction and in a generally planar non-overlapping configuration so that the first reinforcing fibers do not extend over or cover one another[.];

plurality of second reinforcing fibers oriented at  $-45^{\circ}$  (+/-  $15^{\circ}$ ) relative to the pull direction and in a generally planar non-overlapping configuration so that the second reinforcing fibers do not extend over or cover one another, ~~and~~;

a permeable transport web of staple fibers bonded to the first and second reinforcing fibers so that the first and second reinforcing fibers comprise at least 30% of a volume of materials comprising the reinforcing structure; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the pultruded part has a wall thickness of about 0.025- 0.045 inches.

63. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings extending along the longitudinal axis of the part;

a reinforcing structure having a thickness of about 0.004 - 0.020 inches and consisting essentially of: comprising

Amendment and Remarks  
Serial No. 10/015,126  
Page 12 of 18

a plurality of first reinforcing fibers oriented at  $60^{\circ}$  (+/-  $15^{\circ}$ ) relative to a pull direction and in a generally planar non-overlapping configuration so that the first reinforcing fibers do not extend over or cover one another,

a plurality of second reinforcing fibers oriented at  $-60^{\circ}$  (+/-  $15^{\circ}$ ) relative to the pull direction and in a generally planar non-overlapping configuration so that the first reinforcing fiber does not extend over or cover one another, and

a permeable transport web of staple fibers bonded to the first and second reinforcing fibers such that the first and second reinforcing fibers comprises at least 30% of a volume of materials comprising the reinforcing structure; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the pultruded part has a wall thickness of about 0.025-0.045 inches.

64. Cancelled

65. (Currently Amended) A pultruded part having a uniform wall cross-section and a longitudinal axis, the pultruded part comprising:

a plurality of longitudinal rovings oriented along the longitudinal axis of the part;

a reinforcing structure having a thickness of about 0.004 - 0.020 inches and consisting essentially of comprising a permeable transport web of staple fibers bonded to a plurality of first and second reinforcing fibers oriented in a transverse direction continuously across a width of the reinforcing structure so that the first reinforcing fibers are oriented in a generally planar non-overlapping configuration so that the first reinforcing fibers do not extend over or cover one another and so that the second reinforcing fibers are oriented in a generally planar non-overlapping configuration so that the second reinforcing fibers do not extend over or cover one another; and

a cured thermoset resin matrix substantially surrounding the longitudinal rovings and the reinforcing structure so that the pultruded part has a wall thickness of about 0.025-0.045 inches.

66. (Currently Amended) A pultruded part formed by pulling in a longitudinal direction through the die to form a part of predetermined transverse cross sectional shape comprising:

reinforcing fibers extending in a longitudinal direction of the part;

Amendment and Remarks  
Serial No. 10/015,126  
Page 13 of 18

a reinforcement mat having a length extending in the longitudinal direction of the part, a width extending across at least a portion of the transverse cross-sectional shape of the part and a thickness at right angles to the length and width of the part, the mat having a thickness of about 0.004 - 0.020 inches and consisting essentially of comprising a plurality of layers of elongated reinforcing fibers oriented in a direction transverse to the longitudinal direction of the part and in a generally planar non-overlapping configuration so that the reinforcing fibers in any one layer do not extend over or cover one another; transport components arranged to provide longitudinal strength, shear strength and anti-skewing resistance sufficient to allow the reinforcing mat to be carried through the pultrusion die with the reinforcing fibers, and fibers defined by at least portions of staple fibers that extend through at least a portion of the thickness, the staple fiber portions being entangled and bonded with the reinforcing fibers; and

a cured thermoset resin composition surrounding the reinforcement mat and the reinforcing fibers and configured by the die to define the predetermined transverse cross-sectional shape of the part so that the part has a wall thickness of about 0.025-0.045 inches.